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ABSTRACT

Twenty-eight first graders participated in a study to assess the relationship between the auditory channel and reading achievement. For purposes of the study, auditory channel was defined as the skills of auditory discrimination, auditory blending, and auditory memory. The students were administered a series of auditory tests including the Goldman-Fristoe-Woodcock Auditory Discrimination Test, the Illinois Test of Psycholinguistic Ability Auditory Sequential Memory Subtest, and the Peabody Individual Achievement (PIAT) tests. The Slosson Intelligence Test was administered to obtain an intelligence quotient. The PIAT and Slosson scores were then correlated with the auditory channel test scores. The findings revealed that the skills of recognition, memory for content, memory for sequence, and sound blending were significantly related to reading achievement. The skill of auditory sequential memory approached significance. The skill of auditory discrimination, however, was found not to be significantly related to reading achievement. The highest correlations were found between intelligence and reading achievement. The results indicate that tests of auditory functioning are reliable predictors of reading achievement. (FL)

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The Relationship of the Auditory Channel to Reading Ability

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

A Masters Paper in

Developmental and Remedial Reading

by

Roy Albert Dixon Jr.

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STATEMENT OF PURPOSE

Recent research studies have yielded varying results concerning the relationship between the auditory channel and reading ability. Some studies (Dykstra, Robinson, Springer, Durrell and Murphy) have reported positive correlations between the auditory channel and reading ability, while others (Poling, Wheeler and Wheeler, McNinch) have reported non-significant relationships existing between the auditory channel and reading ability. This study will attempt to correlate the relationships between the auditory channel, i.e., auditory discrimination, auditory blending, auditory memory, and reading ability and intelligence. This study will test the hypothesis that there is a significant relationship between the auditory channel and reading ability.

DEFINITION OF TERMS

In our society, words may have several different meanings. In order to assure that the meaning desired is the meaning acquired, several terms used in this study will be defined.

Auditory channel - refers to the skills of auditory discrimination, auditory blending and auditory memory.

Auditory discrimination - is the capacity to distinguish between phonemes, or individual speech sounds used in speech. (20) Operationally defined, this term will refer to scores received in the Goldman-Fristoe-Woodcock Auditory Discrimination Test used in this study.

Auditory blending - is the ability to reproduce a word by synthesizing its component parts. (2) Speaking operationally, auditory blending will be defined as scores received on the Illinois Test of Psycholinguistic Abilities.

Auditory memory - is the ability to remember and correctly repeat a sequence of symbols just heard. (1) Operationally defined, this skill will refer to scores received on the Goldman-Fristoe-Woodcock Test.

Reading Achievement - is a normative statement of an individual's progress in reading. Operationally defined, this refers to scores received on the Peabody Individual Achievement Test.

Intelligence - is viewed as the child's present functioning level. Operationally defined, intelligence will refer to scores obtained on the Slosson Intelligence Test for Children and Adults.

SURVEY OF RELATED LITERATURE

The relationship between the auditory channel and reading ability has been the subject of a variety of research studies in the past. Many have studied various auditory skills and reading readiness since Deputy first reported the results of his study in 1930. (3) However, relatively little research has been published in this area. (6) It has been stated that "Research on the relation of auditory defects to reading ability continue to be meager." (i8)

Dykstra has classified research on auditory discrimination and reading into three major types. The first category can be described as "studies that compare 'good' and 'poor' readers with respect to the auditory capabilities of each". (6:7) Dykstra stated the "when comparisons are made between matched groups of 'good' and 'poor' readers, skill in auditory discrimination appears to significantly related to achievement in reading. In other words, inferior auditory discrimination is a correlate of reading disability, even though present research does not warrant the inference of a cause and effect relationship". (6:16)

The second category of studies involved "correlation studies which assess relationships between auditory discrimination and reading achievement when they are tested simultaneously". (6:7) Several types of research designs have been implemented in correlation studies. Among these research designs are those studies of disabled readers evolving out of clinical situations. In these studies disabled readers are studied and extensive data is collected. The researcher is then able to postulate various correlates of reading disability. Another style of research design mentioned was the survey method in which "tests of reading ability

and of auditory discrimination are administered to a representative group of subjects with the purpose of establishing whether or not significant relationships exist between these two types of measures". (6:8)

The third category of studies are those which "determine relationships between tests of auditory discrimination at the beginning of first grade and reading achievement at the end of first grade or in subsequent grades". (6:7) In these studies a variety of auditory discrimination tests are usually administered to a pre-reading population. An attempt is then made to predict future success in reading. Dykstra states that "studies which have attempted to assess the relation of auditory discrimination ability during the pre-reading period to future success in learning to read have generally reported small positive correlational relationships ranging from approximately .20 to .40". (6:16)

Poling conducted a correlational study which provided data on fifty-eight boys and twenty girls who had been labeled reading disability cases. The participants' intelligence quotients ranged from 100 to 120. The seventy-eight subjects were divided into three groups according to scores achieved on an auditory discrimination test.

The "high" group consisted of thirty students that scored a percentile rank of seventy or above on the auditory discrimination test. The "low" group included ten students who scored below the thirtieth percentile rank on the same test.

Comparisons were made between the "high" and "low" groups with respect to the number and type of errors made by each. The conclusions reached were that the subjects with weak auditory discrimination skills were no more likely to make vowel, consonant or reversal errors than were those who exhibited a higher degree of auditory discrimination skills. (14)

Wheeler and Wheeler (21) reported another study that measured auditory discrimination in a number of ways. Methods employed included: 1) subject selects from a list of three sounds, the sound which he heard in a stimulus word pronounced by the examiner; 2) subject discriminated between paired sounded elements and determined whether each pair was the same or different (er-or), (er-er), etc.; 3) subject discriminates between typical word-pairs; 4) subject selects one word in a group of words which does not rhyme. It was suggested by the investigators, from the data gathered and studied, that "it cannot be concluded that at the intermediate grade level a substantial relationship exists between silent reading ability and the ability to discriminate sounds in a spoken language situation". (21:108)

Dykstra's study (6) assessed the relationship between auditory discrimination and subsequent reading achievement. Involved were seven hundred twenty-four (724) first grade boys and girls. The mean intelligence quotient for the total sample was 102 as derived by the Lorge-Thorndike Intelligence Tests. Seven auditory discrimination subtests and the Gates Primary Reading Test were administered.

Dykstra stated several conclusions from the study. First, that girls were superior to boys in auditory discrimination skills. Secondly, each subtest of the auditory discrimination test was found to be related to reading achievement. However, a combination of these measures distorted the prediction of success immensely.

Robinson (16) compared reading progress through third grade of pupils who were auditorially and visually pretested upon entry into first grade. She concluded that "auditory discrimination had a strongly significant effect on reading scores, regardless of the method used for teaching. The

effects were evident at both first and third grade levels on all tests". (16:33)

Springer (17) reported a study involving fifty-two students from six Trenton schools. All students were Spanish speaking from a low socio-economic background who were given an experimental auditory discrimination test and the Gates-MacGinite Reading Test. Springer applied the Spearm rank correlation coefficients to compute each pair of variables.

Springer reported modest positive relationships between auditory discrimination and composite reading scores, between scores on both auditory discrimination test form I and vocabulary subtest scores, between scores on auditory discrimination test form II and composite reading subtest scores.

In their study concerning auditory discrimination and reading disability, Durrell and Murphy (5) stated that "children who were especially low in auditory analysis of word elements profited particularly by ear training". They further suggest that it is difficult to comprehend how children who have attained excellent speaking vocabularies, clear enunciation, high intelligence and training in phonics can fail to attain the ability to discriminate sounds in words. However, once this deficiency is diagnosed, it responds well to instruction.

In a somewhat related study, Chall, Roswell, and Blumenthall (2) explored the relation between auditory blending ability, reading achievement and I.Q. Their study, using the Roswell-Chall Auditory Blending Test, involved forty Negro children from the New York City Public Schools. The data was gathered from school records and individual tests administered by the authors and their staff. The authors reported two findings they felt were particularly striking.

First is the lack of a significant correlation between auditory blending ability in Grade 1 and I.Q." (2:115) The authors suggested that their results may differ from other reported results due to the fact that their phonics test did not require visual recognition.

The second finding noted was "the substantial relationship between auditory blending ability in Grade 1 and silent reading in Grade 3 (r=.51) and the higher relationship between auditory blending and silent reading with intelligence held constant (r=.64). In other words, silent reading in Grade 3 depends substantially on intelligence in Grade 1..." (2:115) The authors suggest that those students with high intelligence who have extreme difficulty in blending sounds and in word recognition might be showing a sign of a neurophysiological defect or of a lag in development.

The results of a study by Huset (9) concur with the conclusions drawn by Chall, Roswell and Blumenthall concerning neurological factor and reading. Her study included third, fourth and fifth graders matched according to age and intelligence. One group contained students with adequate blending ability, while another contained children with inferior blending ability. The inferior group showed significantly poorer performance on the tests presented.

The conclusions drawn from the Huset study were that: (1) students who had severe reading disability and auditory blending difficulty were more likely to have some sort of neurological involvement. Those students that had severe reading disability and no blending disability did not show this tendency toward neurological involvement; (2) the main difficulty in functioning of children with inferior blending ability is poor integration of both verbal and non-verbal material. In her summary, Huset stated, "it appears that blending ability has a substantial relationship to

reading achievement". (13)

Kass (16) has reported that auditory blending can be used as a predictor for reading achievement in restricted populations. McNinch (12) states "imprecise testing, restricted populations and unreliable instruments inhibit the conclusions drawn from previous research... No studies were discovered that investigated the prediction of reading achievement at the end of the year by assessment of an auditory skill hierarchy when given in conjunction with readiness and intelligence measures". (12:477-78)

Gray (7) was one of the first to expound the theory that failure in auditory memory, failures in acuity or discrimination, inhibit the reading process. Gray's theory has been discussed at length, and few conclusive studies have investigated the relationship between memory and reading. Though research has answered many questions, the question concerning the relationship between the combined auditory perceptual skills and reading achievement remains unanswered.

RESEARCH DESIGN

In order to assess the relationship between the auditory channel and reading achievement, a group of first graders were selected as subjects. The students were administered a series of auditory tests including: (1) Goldman-Fristoe-Woodcock Auditory Discrimination Test, (2) Goldman-Fristoe-Woodcock Recognition Memory Subtest, (3) Goldman-Fristoe-Woodcock Memory for Content Subtest, (4) Goldman-Fristoe-Woodcock Memory for Sequence Subtest, (5) Illinois Test of Psycholinguistic Ability (ITPA) Auditory Sequential Memory Subtest, and (6) ITPA Sound Blending Subtest. The Peabody Individual Achievement tests were administered to obtain reading achievement scores. The Slosson Intelligence Test was administered in order to obtain an intelligence quotient.

All tests were administered within a thirty day period except the Slosson Intelligence Test which was administered upon entry into first grade. The experimenter administered the Peabody Individual Achievement tests to all subjects. A psychometrician, an E.S.E.A. staff member, under the supervision of the school psychologist, administered the auditory channel tests. The Slosson Intelligence Test was administered by the School Psychologist.

The mean and standard deviations for each test administered was determined and appears in Table 1. Correlations between the following were determined, the PIAT and the GFW Auditory Discrimination Test, the PIAT and the GFW Memory for Content subtest, the PIAT and the ITPA Auditory Sequential Memory subtest, the PIAT and the ITPA Sound Blending subtest. The correlation coefficient (r) and the levels of significance appear in Table 2. Each test or subtest, as it may be, was then correlated

with reading achievement, but also with recognition memory, memory for content, memory for sequence, auditory sequential memory and sound blending. This data is provided in Table 3.

METHOD

Population

In order to test the relationship between the auditory channel and reading ability, it was necessary to secure a number of subjects who were currently enrolled in first grade. Furthermore, it seemed desirable to locate a school that had a fairly stable population. Due to the length of testing and the fact that all tests were individually administered, it was also necessary to secure a school in which this was possible. Several schools in the Central Pennsylvania area were considered. The selection process continued until a school was found that met the above criteria.

All first graders in the participating school were subjects of the study. The children were students in a "closed" classroom where the home-room teacher taught all major subject areas. The students met once a week with itinerant teachers who instructed them in art, music, physical education, and library education. Approximately thirty percent of the students met with a remedial reading specialist every day for forty minutes. The socio-economic status of the twenty-eight subjects could not be determined, however the schools' location and the fathers' occupations suggest the lower to lower-middle class.

Instruments

Illinois Test of Psycholinguistic Abilities. The Illinois Test of Psycholinguistic Abilities (ITPA) contains twelve subtests. However, only two of the twelve subtests were used in this study. One of the subtests used is entitled Sound Blending. This test provides one method of assessing the organizing process at the automatic level in the

auditory-vocal channel. The sounds contained within a word are singingly spoken at the rate of two (2) sounds per second, and the subject is asked to tell what the word is. Thus he is required to synthesize the separate parts of the word and produce an integrated whole. The subtest covers a wide range of difficulty levels. The author states, "at the end of the scale it has been made applicable to younger children by including pictures, thus making the task less open ended. At the upper levels the test has been extended by including nonsense words". (25:12)

Auditory Sequential Memory, the other subtest of the ITPA used, was designed to assess the subject's ability to reproduce, from memory, sequences of digits that increase in length from two to eight digits. This test differs from the digit repetition task of the Stanford-Binet or the WISC in that the ITPA digits are presented two (2) per second instead of one (1) per second. Another difference is that the child is allowed a second trial of each sequence if he fails to correctly complete the first presentation. The more rapid presentation makes the tasks easier and accomodates the two and three year old subjects. The authors state that the "tests are designed to isolate defects in: (1) the three processes of communication, (2) the two levels of language input and output. Performance on specific subtests of this battery should pinpoint specific psycholinguistic abilities and disabilities". (25:12)

Reliability. The authors state, "Internal consistency, test retest stability and split-half reliability are the three types of reliability measures available". (25:12) In their article, Weener, Barrett and Semmel stated that "Odd-even split-half reliability were calculated for each age level for respective subtests yielding 108 coefficients with a median of .75 and a range of .39 to .91". (20:376)

Test retest reliability of the subtests of the ITPA ranged from .18 to .86. The authors found the Auditory Sequential Memory and the Auditory Association subtest to have consistently high stability.

Validity. Alfred Hirshoren (8) discusses predictive validity on the ITPA. This is prediction of second grade achievement scores in the California Achievement Test (C.A.T.) from scores derived from the ITPA which had been administered in kindergarten. On the ITPA as a whole, the correlation with reading vocabulary was .47, correlation with reading comprehension was .43.

The author also reported that the correlation of the Auditory Sequential Memory subtest with reading vocabulary of the C.A.T. is .42, that the correlation of Auditory Sequential Memory subtest with reading comprehension of the C.A.T. is .38. Given the author's sample size (40), these correlations are both significant at the .05 level.

The author states that the "Performance on the ITPA subtests at the automatic sequential level is significantly related to performance on all seven of the achievement variables from the C.A.T. (8)

Peabody Individual Achievement Test. This test consists of five (5) subtests, mathematics, reading recognition, reading comprehension, spelling and general information, each containing eighty-four items except for the reading comprehension subtests which contains sixty-six items. Of these five (5) subtests, only subtest two, Reading Recognition and subtest three, Reading Comprehension were used in this study.

The Reading Recognition subtest contains eighty-four items which range in difficulty from pre-school through high school. The items on this subtest include those that involve matching one or more letters of the alphabet with identical stimuli that must be discriminated out from

other increasingly similar ones in a multiple choice format. Also presented in this subtest were items that present individual letters to be named by the student. The rest of the items are individual words that the student reads aloud. Examples can be found in Appendix A.

In the Reading Comprehension subtest, each item consists of two pages each. The first page contains a sentence that the subject reads silently. Each sentence is to be read only once. The second page, which is exposed to the subject after he has read the sentence, has four alternative illustrations on it. The subject is asked to select the illustration that best represents the meaning of the sentence he has just read.

Reliability. The P.I.A.T. was standardized during the period from February through May, 1969. The first half of this period was devoted to initial testing from which the norm tables were derived; and second half was devoted to retesting to secure test-retest reliability data.

The P.I.A.T. reliability evidence was gathered by readministering it to samples of fifty to seventy-five subjects each, at the kindergarten, first, third, fifth, eighth and twelvth grade levels. The split-half reliability technique was not utilized because it was likely to result in spuriously high estimates of reliability for a test on which items have been carefully ordered in difficulty and on which the basal and ceiling procedure is utilized. Pearson product correlations were calculated on raw scores for each of the five subtests and for the total test.

The reliability coefficients vary from a low of .42 for kindergarten subjects in spelling to a high of .94 for third grade subjects in reading recognition, with an overall median of .78. Considering median values, greatest confidence can be placed in the stability of the total test (.89) and reading recognition (.89), and least in reading comprehension

(.84) and spelling (.65). In terms of median values, scores were most stable at the first, fifth and eighth grade levels (.80), and lowest at the kindergarten level (.74), though the variability across levels was not great.

Validity. The discussion concerning the validity of the PIAT has been divided into two sections. The first will be concerned with content validity. The second will deal with concurrent validity.

Content validity is essentially a matter of whether or not the individual items in fact measure the subject matter to be measured. It also concerns the extent to which a test adequately samples the universe of material or content appropriate for the test. This type of validity then is the primary validity concern in the construction of achievement tests.

For this test, an initial pool of items, usually about three hundred items per subtest, sampled fairly well the content areas. However, the final PIAT battery contained only eighty-four items per subtest (sixty-six in the case of reading comprehension) to measure over the wide range from the kindergarten through the twelfth grade level. Items were retained after item discrimination and difficulty indices were used. A curve was drawn for each item showing the percentage of field-test subjects passing at each successive grade level. The items that showed the sharpest curves were retained and placed at the grade level where approximately fifty percent of the subjects passed.

In the process of standardization, data was produced in concurrent validity consisting of correlations with a measure of scholastic aptitude. During the period of retesting for reliability data, all subjects were given the Peabody Picture Vocabulary Test (PPVT) Form A. The PPVT

intelligence scores were correlated with the subjects' retest PIAT scores. Generally, the hearing vocabulary, as measured by the PPVT, correlated most highly with the General Information and Total Score. The hearing vocabulary correlated least well with spelling and mathematics. The overall median correlation was .57. This is consistant with the data as with twenty-eight other studies of relationships of the PPVT with other tests.

Goldman-Fristoe-Woodcock Auditory Memory Tests. The Goldman-Fristoe-Woodcock Auditory Memory Tests (GFW Memory) are part of the entire GFW Battery. They have been designed to assess three (3) aspects of short-term auditory memory performance. The Recognition Memory, Subtest 1, measures the ability to recognize an auditory event which has occurred in the immediate past. The Memory for Content, Subtest 2, measures the ability to recognize the elements in an auditory event without regard for the sequence of these elements. The Memory for Sequence, Subtest 3, measures the ability to remember the order of the elements in an auditory event.

All subjects were recorded on magnetic tape, therefore requiring all subjects to use earphones. According to the authors of the test, the norms were developed under the condition that earphones be utilized.

Due to the fact that the GFW Memory was recently developed (1974), this author found no information reporting reliability and validity. The test manual offered some information concerning interpreting scores. However, data on reliability and validity was not presented.

Goldman-Fristoe-Woodcock Test of Auditory Discrimination. The Goldman-Fristoe-Woodcock Test of Auditory Discrimination (GFW Discrimination) was designed to provide measures of speech-sound discrimination ability. The test was designed to be used with children four (4) years

of age to adulthood. The author stated that a measure of auditory discrimination under ideal listening conditions plus a comparative measure of auditory discrimination in the presence of controlled background noise was provided.

This test is comprised of three (3) parts. The first is the Training Procedure, which makes the subject familiar with the word-picture association to be used during the two (2) subtests and also allow the examiner to establish the presence of these associations. The second part is the Quiet Subtest that provides a measure of auditory discrimination in the absence of distracting background noise. The third part is the Noise Subtest which provides a measure of auditory discrimination in the midst of distracting sounds. The authors provide separate norms for each subtest from ages three (3) years eight (8) months to seventy (70) years and over.

Reliability. The authors reported data for internal-consistency and test-retest reliability. For the internal-consistency reliability, the split-half method was utilized and corrected by the Spearman-Brown formula. The clinical sample used consisted of 242 subjects drawn from various groups of children who received diagnostic or remedial aid. The reliability coefficients were low in comparison to those observed for several other psychological instruments. The test-retest reliability reported a correlation of .87 on the quiet subtest and .81 on the noise subtest. The results were obtained by administering the GFW Discrimination test to a sample of seventeen (17) preschool speech handicapped subjects. At a later date this group was again administered the GFW Discrimination test.

Validity. To assure content validity, the authors presented the tasks so that the process of speech-sound discrimination in the test is similar to the real-life task. This simulation of the real-life task includes the controlled presentation of the test under conditions of noise as well as quiet. The words used in the test were selected according to the familiarity and meaningfulness to young subjects. The GFW Discrimination requires the student to make five speech-sound discrimination in the context of familiar language in a controlled test situation closely reproducing the speech-sound discrimination task in real life.

The authors concluded that concurrent validity, the high correlation of one measure to a like measure, was difficult to substantiate for this test. They reasoned that other auditory discrimination tests are confounded by the effects of factors other than auditory discrimination. However, the authors did provide data obtained from expert clinicians. A group of eighteen (18) subjects and twelve (12) subjects respectively, were judged to be "poor discriminators" and "good discriminators". A point biserial correlation coefficient of .68 was obtained between the T-scores on the Quiet Subtest and the clinical judgment. A correlation of .72 was derived between T-scores on the Noise Subtest and clinical judgment.

In their discussion on construct validity, the authors cited three types of evidence that the test is measuring some construct in a predictable way. The evidence cited included changes in performance with age, relative levels of performance among selected groups of students and low correlations with non-measures of auditory discrimination.

The performance in a psychological trait such as auditory discrimination would be expected to improve during a child's growing years and level

off during adulthood. The authors stated in their manual that the data demonstrated the changes with age, expected of a developmental trait, mean error scores decreases until subjects come into their twenties; then scores remain relatively stable until about forty when there is a gradual increase in error scores.

Relative level of performance is the performance of certain groups of subjects who would perform more poorly than the general population in a valid test due to their disability. For example, a subject who has a speech or language problem would be expected to do more poorly than the general population on a valid auditory discrimination test.

The authors presented data that illustrated the fact that those who had some form of disability did perform more poorly on the GFW than the general population.

In the third type of evidence supporting the argument for construct validity, the authors reported that a group of forty (40) preschool children were administered the GFW. Data already on hand were the Stanford-Binet, and T-M (Terman and Merrill, 1960) IQ's for each subject. A product-moment correlation of .60 was derived between the Quiet Subtest T-scores and Stanford-Binet IQ's. A correlation of .52 was obtained between Noise Subtest T-scores and IQ's. The authors reported a correlation of .80 between T-scores on the two subtests of the GFW for the same sample.

Slosson Intelligence Test. The items selected for this intelligence test are similar in nature to the valid Stanford-Binet tasks. The authors state, "This short test has a higher ceiling for adults and a lower base for children than the Stanford-Binet. There has been some criticism of the mental age (MA) concept but it has been maintained in the SIT as it is considered to be both meaningful and useful. One should not, however,

make the mistake of thinking that a particular task or item occurs at too specific an age level. It is for this reason that the 'ten in a row' system of failures and passes has been employed in scoring". (26:iv)

Reliability. A relatively high reliability coefficient of .97 was obtained for the SIT when 139 individuals from age four (4) to age fifty (50) were tested, then two months later retested. The mean intelligence quotient of the original test was 99.0 with the mean intelligence quotient of the retest being 101.3. The Standard Deviations were 24.7 and 25..1 respectively.

Validity. In order to avoid any bias, the author provided independent testing of 141 subjects. The independent testing was administered by the author, a teacher, principal, guidance counselor, social worker or nurse. Both the Stanford-Binet and the SIT was administered. Correlations again were relatively high with a correlation coefficient of .92 being obtained. The authors state that this "Intelligence Test (SIT) yields sufficiently valid IQ's for children four years of age into adulthood, as to furnish a useful screening instrument in the hands of responsible professional persons. No significant sex differences were found for any of these age groups. For children under four years of age, the IQ's must always be considered as tentative". (26:viii)

Procedure

Administration of the previously mentioned tests (auditory memory, auditory discrimination, auditory blending, and the achievement test) was completed on an individual basis. A psychometrician, under the supervision of a school psychologist or this author, administered all tests. Although the testing situation was not ideal, all efforts were

made to insure a good testing situation.

It was felt by both the author, the psychometrician and the school psychologist that the performance on the Goldman-Fristoe-Woodcock Auditory Discrimination Test was hindered by the regional accent of the presenter. The Goldman-Fristoe-Woodcock Discrimination Test was normed according to prepared tapes accompanying the test. In order to not break standardization, the tests were administered as instructed. However, the regional accent of the presenter distorted various words. This is a defect the authors of the Goldman-Fristoe-Woodcock Discrimination Test may want to review carefully.

Summary of Data

The specific purpose of this study was to discover a possible relationship between reading achievement and functioning of the auditory channel. For this purpose, the Peabody Individual Achievement Test scores were correlated with the auditory channel tests. The statistic used in this correlation was the Pearson product moment correlation technique.

$$(r\ x\ y = \frac{n\Sigma x\ y - \Sigma x * \Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2] * [n\Sigma y^2 - (\Sigma y)^2]}}$$

Table 1 (Page 23) presents the mean and standard deviation scores obtained from administration of the various auditory channel tests, the Slosson Intelligence Test and the Peabody Individual Achievement Test.

Table 2 (Page 24) presents the correlations between the total reading achievement score and the Slosson Intelligence Test and the tests of auditory channel functioning.

It must be noted that twenty-seven degrees of freedom were used to

compute the significance levels (n = .38, p. .05; n = .50, p. .01). Four of the six correlations with auditory channel functioning exceed the level that would be expected by chance. The correlation with intelligence was significant. Specific significant correlations are discussed under "Results".

Table 3 (Page 25) illustrates the inter-correlations of tests measuring various aspects of auditory channel functioning as well as correlations between intelligence and auditory channel tests. The GFW test of Auditory Discrimination was not significantly related to any of the other tests of auditory functioning. Six of the seven inter-correlations between the remaining auditory channel tests (GFW tests to Auditory Memory and ITPA subtests) were statistically significant. Intelligence was significantly related to all auditory channel tests except for the GFW test of Auditory Discrimination.

TABLE 1

Means and Standard Deviations of Test Scores

	Mean ($\bar{x}$)	Standard Deviation
*PIAT (Total Reading Score)	1.95	.51
**Slosson Intelligence Test	119.29	17.30
***GFW Auditory Discrimination	31.04	9.65
***GFW Recognition Memory	50.29	7.46
***GFW Memory for Content	47.54	10.78
***GFW Memory for Sequence	58.00	14.51
****ITPA Auditory Sequential Memory	35.18	6.59
****ITPA Sound Blending	45.50	9.39

*Grade-level equivalent

**Intelligence quotient

***Standard Score (mean of 50)

****Scaled Score (mean of 36)

TABLE 2

Correlations Between Reading Achievement
and Tests of Auditory Channel Functioning

	Correlation Coefficient (r)	Level of Significance
PIAT and Slosson Intelligence Test	.65	.01
PIAT and GFW Auditory Discrimination	.08	n.s
PIAT and GFW Recognition Memory	.54	.01
PIAT and GFW Memory for Content	.46	.05
PIAT and GFW Memory for Sequence	.56	.01
PIAT and ITPA Auditory Sequential Memory	.34	n.s
PIAT and ITPA Sound Blending	.43	.05

Levels of significance were obtained from Table 15 [illegible] E.S. Pearson and H.D. Hartley (Eds.), Biometrike Tables for Statisticians, Vol. 1, 2nd Ed. (Cambridge University Press, New York, 1958).

.38 required for significance at .05 level

.50 required for significance at .01 level

TABLE 3

Intercorrelations of Tests Measuring
Auditory Channel Functioning and Intelligence

	SIT	AD	RM	MC	MS	ASM	SB
SIT	1						
AD	.17	1					
RM	.54**	.06	1				
MC	.61**	.15	.55**	1			
MS	.62**	.01	.50**	.57**	1		
ASM	.57**	.26	.24	.37	.45*	1	
SB	.69**	.29	.22	.45*	.49*	.59**	1

*Significant at .05 level

**Significant at .01 level

SIT - Slosson Intelligence Test

AD - GFW Auditory Discrimination Test

RM - GFW Recognition Memory Test

MC - GFW Memory for Content Test

MS - GFW Memory for Sequence Test

ASM - ITPA Sequential Memory Test

SB - ITPA Sound Blending Test

RESULTS

Discussion

This study attempted to ascertain the relationship between the auditory channel and reading achievement. It was found that the skills of recognition memory, memory for content, memory for sequence and sound blending were significantly related to reading achievement at the .05 level. The skill of auditory sequential memory approached significance at the .05 level. However, it was found that the skill of auditory discrimination was not significantly related to reading achievement. The highest correlations were found between intelligence and reading achievement.

The data presented in Table 3 indicates an inter-correlation between intelligence and the following auditory skills: recognition memory, memory for content, memory for sequence, auditory sequential memory and sound blending significant at the .01 level. Recognition memory was significantly correlated at the .01 level with both memory for content and memory for sequence. Memory for content was significantly correlated with memory for sequence at the .01 level. Sound blending was significantly correlated with memory for content at the .05 level. Memory for sequence significantly correlated with auditory sequential memory and sound blending at the .05 level. Auditory sequential memory was significantly correlated with sound blending at the .01 level. It was found the auditory discrimination did not significantly correlate with any of the other tests of auditory functioning or intelligence.

Implications

The results of this study indicate that tests of auditory functioning are reliable predictors of reading achievement. Although the results did not indicate a significant relationship between auditory discrimination and reading achievement, it is felt that the GFW Discrimination Test did not accurately assess the auditory discrimination skill of the subjects possibly due to the regional dialect of the presenter.

The data substantiated earlier studies indicating intelligence as being a reliable predictor of reading success.

Recommendations

It is recommended that the study be replicated using an auditory discrimination test which eliminates the variable of a regional dialect inappropriate for the given population.

Appendix A (The Reading Recognition and the Reading Comprehension subtests of the Peabody Individual Achievement Test) were removed due to copyright restrictions. See No. 22 in the bibliography.

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